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Daer Prof. Lederberg,

Sorry for my late reply.

Following is the analysis I wrote according to the points you noted, and in the same sequence posed by you. I would be most grateful if you could fix it (or revise it, if needed), in terms of both essence and sequence (for instance - maybe the paragraph dealing with the new era, should be the final one, rather than appearing as an intermediate paragraph). Also, I think some sort of a connection should be formed (better by you, I suppose) between the text I wrote about Iraq, and the following analysis.

GLOBAL PROJECTIONS Further projections may be configured in the global dimension. The very conjunction of naturally designed virulence (of existing pathogens, constituting a maneuverable platform of cardinal, given genetic information), immeasurably progressing biotechnology (mainly genetic engineering), and inherited curiosity if not malignity, at times - of the human race, might form a seed of tribulation. Hence, regardless of deproliferation and nonproliferation trends, it is essentially but a matter of time until the colossal potentiality of BW ripens. That course is at any rate apt to accelerate, due to uncontrollable and, presumably, irreversible - efforts currently made by certain states and organizations. In that sense, Iraq is just a remarkably blatant example, yet it is liable to be followed by others, in addition to countries which adhere for long to ongoing BW programs. Consistent upgrading of BW is an inevitable outcome, which would not skip those countries. Unintentionally, gradually, almost elegantly, the infrastructure to a world in which BW capabilities are well advanced is being shaped, in effect, nowadays. Apparently, that advancement and spread is a built-in, silent component within the very present front of human civilization. Taking into account those factors, together with the elevating density of most populations all over the world, it appears as if a synergistic process might be taking place, through which a significant demonstration of the potency of BW would eventually occur. Such an occurrence may be the result of deliberated implementation of BW, leakage of a biological warfare agent, or natural epidemic, the latter being a major, fundamental natural mechanism for thinning out exploding populations in general. A disastrous happening of that sort would bring out the credibility of BW in a manner unavoidably playing effectively into security policies, balance of power, deterrence, further national-related strategies, and, conceivably, futurity of mankind, altogether.

The impact, in those respects, would expectedly be expedient, by all means, though, in a sense, late, namely belonging to the category of lessons learned but after damage is already brought about. Nonetheless, the mode of thinking, as well as the paradigms of various national strategies may change consequently or, possibly better, in advance - the corollaries being both conceptual and practical. Maximum flexibility, versatility and modularity might be, then, the key factors underlying the designing, exercising and giving effect to security

regimes, balance of power layouts, deterrent might, retaliatory capacities and so forth. Those key factors may rather consist in the very basic layer of any related doctrine, and, hence, dominate all the derivatives and ramifications as well. They are required, so as to gain adequate competence for monitoring, differentiating, and gauging both static and dynamic environments, both proximal and remote. Concomitantly, still, a comprehensive system of rigid though constantly updated - definitions should be in use, not at all impairing the validity of those previously mentioned non-rigid key factors. Further, in more concrete terms, and beyond self-evident essential milestones - like increased intelligence, alertness, acquaintance, awareness, practice, skillfulness, preparedness and readiness - multinational cooperation and coordination may play a crucial role, provided that full mutual trust is attainable. Such vital interface is inclined to serve for coping bio-terrorism and for strengthening deproliferation and nonproliferation. Yet, whenever not attainable, defined alternative states of imperfect confidence, distrust, disharmony, rivalry, hostility or enmity should serve for classifying the resulting type of interplay to be crystallized toward given countries and organizations, in terms of the above detailed strategic parameters.

The central axis of the entire concerned approach should at any rate be the foreseeable prevailing advanced BW. It is indeed the core of the whole system discussed herein. Advanced pertains, in that context, to either the intrinsic biological properties of the pathogen (or toxin), the qualities of the substance (particularly in light of the super-powder used for the anthrax letters), the delivery system, and the mode of dissemination. Though considerable upgrading is expected regarding all those four features, the former is still of utmost importance. This is true especially with respect to tailored pathogens or toxins, bearing potential far-reaching consequences as BW, and even challenging, at the same time, the subtle evolutionary interface between mankind and pathogens. BW against farm animals and crops do not lag far behind BW against humans, and the recent catastrophic foot and mouth epidemic in Britain was fairly illustrative, in that concern, unfortunately. It thus seems that the dawn of a new era is already brought into being, an era perfectly demanding its supremacy and uniqueness to be recognized. The right to share or secure knowledge is definitely the very fundamental key issue, with respect to most aspects of the given subject matter; domestically, internationally, scientifically, popularly, publicly, diplomatically, politically, tactically, strategically, and so forth. Transparency, still, might be the grand line, in that when fully attained, it may establish, internationally, intact confidence, remove doubts, save time needed for deciphering and interpreting, prevent misinterpretations, and yet permit effective and productive negotiations. Moreover, it may entirely antagonize, conceivably, brinkmanship and states of crisis. It appears, then, as if the complexity of and menace posed by the anticipated new era should bring about strict security of know-how and biotechnologies, along with broad, almost unlimited transparency of policies and strategies. Such combination is not contradictory, rather complementary. The imminence of the new era is further accentuated by high asymmetry, inevitably shaped by increasing terrorism, a current trend that can hardly be countered, in actuality.

The real complex, formidable essence of BW and its corollaries are exhibited also by problems of attribution, well illustrated by the anthrax letters affair. It is indeed an objective, sever factor to face. Usually, genetic fingerprints of the employed pathogen would serve to eliminate potential perpetrators on the least, rather than pointing at the user, unless comprehensive relevant background information is available. The user would in all probability

make great effort to blur any traces. For that reason, he may prefer modes of sabotage even while holding strategic delivery systems of BW. Clandestine employment plus incubation period might combine so as to permit optimal disappearance of the operators, particularly if immunized. In that case even a basic question as whether the act of bio-sabotage is state- or non-state-sponsored, might remain without answer. Yet, totally untraceable might be if perfectly carried out - even the conduction of a biological attack through an unmanned spraying flying device. Moreover, if traces are found, the distinction between authentic ones and misleading ones might be more difficult than the interpretation of the latter in themselves.

The complete strategic value of BW may gain, then, on the whole, another magnitude, equaling - if not exceeding - in certain senses, the status of nuclear weapons, both when nuclear weapons are in dearth, or, inversely, are present, serving for backing BW. This duality is trapping, since in both positions the employment of BW is plausible. Nevertheless, avenues of catalytic interference by nuclear threat parties are an additional factor of major significance. Such interference may find expression in either relying on ones own nuclear capability, reckoned to back BW employment, or in furnishing nuclear umbrella to another perpetrator. In that regard, the perpetrators calculus that by no means would BW employment bring about nuclear retaliation - since the latter seemingly constitutes at any rate an unreasonable act of escalation - is a key issue that ought to be untied, possibly through fully transparent counter-strategy.

A pandemic contagion may be generated unintentionally, deliberately or indifferently. The outcome would anyhow be extensive, demanding, therefore, early international preparedness at highest political and professional levels. In a scenario of global contagion, the in effect impact would in any case exceed probably considerably - the anticipated one. The prospect of a global contagion should conceivably be an effective deterrent towards any state, and hence be brought out, yet in a very meticulous, optimal manner, minimizing the attempting element hidden in it. It would not hinder, however, non-state initiatives. The only way to cope those is increased and upgraded intelligence.